BASSIA (CHENOPODIACEAE) IN NORTH AMERICA

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ABSTRACT

A survey of literature and herbarium specimens indicates that two species of *Bassia* (Chenopodiaceae), both introduced, have become established members of the North American flora. *Bassia hirsuta* entered the flora of North America around 1900, and has gradually expanded its range along the East Coast. *Bassia hyssopifolia* has spread extensively in western North America since its introduction in Nevada around 1915, and has maintained a limited distribution in the East following its introduction there around 1930.

INTRODUCTION

The introduction of non-indigenous species into a geographic region may alter the structure and composition of local plant populations, in some cases presenting deleterious ecological consequences. The history of *Eichhornia crassipes*, water hyacinth, in North America clearly demonstrates this point. All too frequently botanists do not adequately document the spread and effect of adventive species (particularly their ability to compete with local species), even though such studies are usually feasible, interesting, and sometimes valuable. Many questions on immigrant species often remain unasked, not to mention unanswered, including: Where did the plant come from? When and how was it introduced? Where has it spread since its introduction, and by what mechanisms? What habitats does it invade? Has it become a permanent member of the flora? Will it probably continue to extend its non-intrinsic range?

In reference to the above questions, the genus *Bassia* (Chenopodiaceae) can be taken as an example. *Bassia*, a rather well-known and significant Eurasian genus of annual herbs, has about 10 species (ca. 90 species if the Australian *Austrobassia* is included in it); however, little is known (at least by any kind of comprehensive study) of its adventive distribution, particularly its North American occurrence. In addition to distributional questions, the genus presents nomenclatural difficulties. Several authors (cf. Iljin, 1936; Standley, 1916; Mason, 1957) used an alternate generic name, *Echinopsilon*, in preference to *Bassia*. To add to the confusion, some taxonomists employed the name *Bassia* for a genus of Sapotaceae (cf. Airy Shaw, 1973). Nomenclatural problems exist at the species level as well. Authorship of the combination *Bassia hyssopifolia*, for example, has been credited to Kuntze (cf.

SIDA 8(1): 57–64. 1979.

Gleason, 1952) or to Volkens (cf. Davis, 1952; Aellen, 1964). In our study, in addition to providing distributional information, we attempt to clarify the nomenclatural aspect.

NOMENCLATURE

The generic name *Bassia* was "originally" published on two separate occasions. Allioni in 1766 (Mélanges de Philosophie et de Mathématique de la Société Royale de Turin, p. 177) assigned the name to a genus in the Chenopodiaceae. Independently, Koenig proposed the name for inclusion in Sapotaceae, but did not publish it. Linnaeus subsequently validated Koenig's manuscript name by incorporating it in his *Mantissa* (*Mantissa Plantarum* 2; Appendix, p. 563; 1771). As both names are validly published under the rules of nomenclature, *Bassia* Koenig ex Linnaeus (Sapotaceae) must be regarded as illegitimate and to be rejected as a later homonym. *Bassia* Allioni is the correct name of the genus.

A commonly used synonym of *Bassia* Allioni is *Echinopsilon* Moquin-Tandon. However, publication of this name (Annales des Sciences Naturelles 2,2: 127, 1834) was much later than that of *Bassia* Allioni, and there would seem to be no reason for selecting it over *Bassia. Chenolea* Thunberg (*Nova Genera Plantarum* 10, 1781), which has likewise been preferred in some cases over *Bassia* (e.g., Bentham and Hooker, *Genera Plantarum* 3: 60, 1880), also has a later date of publication, and, in addition, probably constitutes a distinct genus (cf. Airy Shaw, 1973).

Credit for the combination *B. hyssopifolia* should go to Kuntze (*Revisio Generum Plantarum* 2: 547, 1891) rather than Volkens (in Engler and Prantl's *Die Natürlichen Pflanzenfamilien* 3,1a: 70, 1893) on the basis of priority. The correct citation is *B. hyssopifolia* (Pallas) Kuntze, based on *Suaeda hyssopifolia* Pallas.

DISTRIBUTION

Only two species of *Bassia, B. hirsuta* and *B. hyssopifolia*, have been recorded in North America. Though introduced, both species are well-established, permanent members of the flora. The distribution of each is discussed separately below. Discussions are based in part on specimens from the following herbaria: A, F, GH, JEPS, MO, MU, NY, OSC, PH, RM, TEX, UC, US, and UT. We are grateful to the curators of these herbaria for the loan of specimens.

The two species of *Bassia* occurring in North America may be distinguished as follows:

Bassia hirsuta: Floriferous portion of branches with flexuous axis; three sepals bearing a short, non-hooked, dorsal process in fruit, the other two sepals unappendaged.
Bassia hyssopifolia: Floriferous axis straight; all five sepals bearing a slender, hooked prickle in fruit.

Bassia hirsuta

Bassia hirsuta (L.) Ascherson, the first *Bassia* species to appear in North America, maintains today a limited though well-established distribution along the east coast of the United States. Native to Europe (type locality: along the seacoast of Montpellier, France), *B. hirsuta* apparently entered our flora around the turn of the century. Earliest specimens are from southern New Jersey (Anglesea, Cape May County, 30 Aug 1900, *Brown s.n.*, PH; Barnegat Bay Beach, Ocean County, 21 Jul 1900, *Harshberger s.n.*, PH). However, early floristic studies (e.g., Robinson & Fernald, 1908; Britton & Brown, 1913) neglected this species. In fact, we find no mention of the plant in literature until Taylor (1915) alluded to its presence along the borders of salt marshes around New York City. By this time, its distribution, according to herbarium records, reached from Massachusetts to New Jersey. Initial spread was apparently rapid, as it was recorded in South Boston by 1908 (12 Sep 1908, *Knowlton s.n.*, GH). Knowlton commented (on the specimen label) on the abundance of *B. hirsuta* on "made land, in tidal brook and elsewhere." Standley (1916) wrote "adventive on sandy seashores, New Jersey, and at Boston, Massachusetts," indicating a possible disjunct distribution. As indicated above, however, the plant was already present in New York State by the time of Standley's writing. In fact, a specimen (*Bicknell 3968*, PH) was collected from Long Island in September 1915, and it is likely that *B. hirsuta* actually invaded the New York flora several years prior to this.

According to more recent floristic literature (e.g., Fernald, 1950; Gleason, 1952), the distribution extends from Massachusetts to Maryland, in coastal sandy or saline habitats. Herbarium records confirm this habitat statement but indicate a range south to Virginia (Chincoteague Is., 23 Jul 1938, *Travis 679*, PH). Delaware is the only state between Massachusetts and Virginia from which *B. hirsuta* has apparently not been recorded either by literature or herbarium specimens. However, it is not likely that disjunction is actually involved. A careful search would probably show a limited occurrence of the species within the state's coastal islands.

As to the future of *B. hirsuta* in North America, a limited increase in range with time is probable, confined primarily to saline coastal areas. This statement is based on the documented gradual increase (since its original rapid spread) up to the present, the availability of additional coastal area for colonization (particularly south), and the local success of populations as suggested by information on herbarium specimen labels. Several collectors indicated that *B. hirsuta* was densely established on various beaches (e.g., *Knowlton s.n.*, South Boston, 4-18 Sep 1909, UC). Fernald (1950) stated that the plant "appears indigenous," an indication of its success in naturalization and its potential for persistence.

The method of entry and spread is uncertain; thus, we are limited to speculation. Considering the plant's lack of economic value and its relative

unsightliness, it was in all probability not imported purposefully. The immigration of *B. hirsuta* to this continent must be considered accidental and mose likely due to man. As its early distribution (around 1908) in North America was possibly disjunct (Massachusetts and southern New Jersey), it is not improbable that the species was introduced from Europe more than once. After it initial introduction and establishment, shore animals (especially birds) and tidal activity certainly contributed to a gradual range expansion.

Representative Specimens (one specimen from each county recorded in our study is included): UNITED STATES: MARYLAND: Worcester Co.: brackish flat bordering Assawomen Bay, Ocean City, 16 Sep 1941, *Herman 10769* (MO, NY, US). MASSACHUSETTS: Barnstable Co.: Monument Beach, Bourne, 18 Aug 1921, *Blake 8363* (TEX); Dukes Co.: Penikese Island, 31 Jul 1947, *Moul and Moul 3247* (PH); Norfolk Co.: Wollaston, 21 Sep 1918, *Blake 7195* (US); Suffolk Co.: South Boston, 12 Sep 1908, *Knowlton s.n.* (GH). NEW JERSEY: Atlantic Co.: Atlantic City, 25 Sep 1906, *Wheeler s.n.* (US); Camden Co.: Cooper's Point R.R. Freight Yard, Camden, 19 Aug 1932, *Witte s.n.* (PH); Cape May Co.: Anglesea, 30 Aug 1900, *Brown s.n.* (PH); Cumberland Co.: Delaware Bay, Moore's Beach, Robinson's Beach, s. of Delmont, 22 Jun 1933, *Long 40685* (PH); Essex Co.: Port Newark, 23 Sep 1933, *Edwards and Clausen 497* (NY); Ocean Co.: Barnegat Bay Beach, 21 Jul 1900, *Harshberger s.n.* (PH). NEW YORK: Nassau Co.: Long Beach, East Point, Long Island, 19 Sep 1915, *Bicknell 3968* (PH); Suffolk Co.: Point-O-Woods, Long Island, 9 Sep 1921, *Ferguson 879* (NY); Queens Co.: Jamaica Bay Sanctuary, Queens, Long Island, 7 Sep 1958, *Monachino 629* (NY). VIRGINIA: Accomack Co.: Chincoteague Island, 23 Jul 1938, *Travis 679* (PH).

Bassia hyssopifolia

Bassia hyssopifolia (Pallas) Kuntze apparently entered the flora of North America 15 to 20 years later than *B. hirsuta*. Like *B. hirsuta, B. hyssopifolia* must be regarded as introduced in North America; it is native to parts of Europe and Asia (type locality: Caspian Sea region). Unlike *B. hirsuta, B. hyssopifolia* appeared first in western North America. The earliest reference we found to *B. hyssopifolia* in America (Blake, 1922) cites Fallon (Churchill County), Nevada (28 Jul 1919, *Tidestrom 10755*, US) as the site of earliest collection. A search of early floristic literature (e.g. Jepson, 1923; Rydberg, 1906, 1917; Standley, 1916) yielded no mention of *B. hyssopifolia.* It is included, however, for Nevada by Tidestrom (1925) and in more recent western floras (e.g., Harrington, 1954; Kearney & Peebles, 1960; Munz & Keck, 1959; Hitchcock & Cronquist, 1973; Weber, 1972). In general, the plant is said to be well-established, especially in saline or alkaline habitats varying in altitude from below sea level to several thousand feet.

The earliest North American specimen in a herbarium is that of T. H. Kearney (US), 1917, from Fallon, Nevada—a collection apparently unknown to Blake. As the plant was probably present a year or so prior to collection, 1915 would be reasonable as to the approximate time of introduction. After establishment in Nevada, *B. hyssopifolia* spread rapidly in all directions.

Based on herbarium records, the following would be the sequence of establishment: California, 1919; Washington, 1921; Utah, 1924; New Mexico, 1926; Montana, 1927; Texas, 1928; Oregon. 1932; Arizona, 1936; Colorado, 1936; Idaho, 1937; British Columbia, 1937; Wyoming, 1939; and South Dakota, 1959. It is probable that *B. hyssopifolia* entered Oregon considerably earlier than records show, thus providing access to Washington, Idaho, and Canada. According to Moss (1959), this species has been found in Alberta.

The means of introduction and dispersal of *B. hyssopifolia* seems relatively clear. As the earliest plants were discovered in rangeland near the Fallon experimental Station in Nevada, it is conceivable that propagules entered originally from Eurasia as a seed contaminant. *Bassia hyssopifolia* grows well in soil too alkaline for crops (Blake, 1922) and thus finds a suitable niche in impoverished abandoned fields. The sepals persist around the ripened fruit, and each bears on its back a hooked spine (hence the common name "five-hook bassia"). These small hooks attach the one-seeded fruits readily to clothing, livestock, or wildlife, providing an effective dispersal mechanism. Establishment in dry, alkaline or saline environments where competition is minimal would seem to aid survival and necessitate regarding *B. hyssopifolia* as a permanent, and sometimes "weedy," member of the North American flora. As stated by Munz and Keck (1959), *B. hyssopifolia* is "becoming a common weed in rather alkaline places through much of Calif. and in other w. states."

Some 15 years after its introduction in western North America, *B. hyssopifolia* appeared in coastal eastern North America. The earliest herbarium specimens from the east are dated 1936 (Massachusetts, 5 Sep 1936, *Bean s.n.*, GH; and New York, 3 Sep 1936, *Monachino 161*, NY). However, literature (Palmer, 1930; Bean, 1937) points to an earlier arrival. Palmer (1930) documented the spontaneous growth of *B. hyssopifolia* in an abandoned quarry near the Arnold Arboretum in the Boston area. Later (1936), Bean discovered the plant near Fish Pier and the freight yard area of South Boston and also alluded to its occurrence several years earlier near Worcester, Massachusetts. Based on the evidence, 1929-1930 is the probable time of introduction of *B. hyssopifolia* in the east. There are no firm facts by which to confirm whether this appearance in the eastern United States constituted a second introduction from Eurasia or a transmittal from the western United States. Bean reported the Fish Pier locality as a vacant lot where wool-waste was thrown out and hinted at an introduction from southwestern Asia. However, this information provides an insufficient basis for making final judgment as to the source of the introduction. Regardless, *B. hyssopifolia* has maintained a limited distribution on the east coast. Seymour (1969) contended that the plant is rare in Massachusetts, being found in only four locations: Chelmsford, South Boston, Westford, and Worcester. The two New York counties in which it grows are both on the western end of Long Island. Thus, it seems safe to assume that *B. hyssopifolia* occurs in scattered

locations from Boston to New York City and that it will remain in the eastern flora, perhaps not extending its range to any appreciable extent.

Representative Specimens (one specimen from each county recorded in our study is cited): CANADA: BRITISH COLUMBIA: Cariboo Co.: Three Mile Lake, S of Clinton, 12 Aug 1956, *Calder, Parmalee and Taylor 20061* (GH, NY); Prince Rupert Co.: 1 mi E of Inverness, 11 Aug 1958, *Taylor and Ferguson 3752* (UC); Yale Co.: near alkaline lakes below Sugarloaf Hills, Kamloops, 17 Oct 1965, *Krajina 65101713* (NY).

UNITED STATES: ARIZONA: Maricopa Co.: Arlington, 12 Aug 1936, *McLellan and Stitt 1009* (US); Navajo Co.: Kayenta, 11 Sep 1938, *Eastwood and Howell 6541* (US). CALIFORNIA: Alameda Co.: Newark, 21 Oct 1966, *O'Brien s.n.* (UC); Colusa Co.: Maxwell, 1 Oct 1929, *Jepson 15341* (UC); Fresno Co.: 1 mi W, 2 mi S of Fresno, 23 Oct 1919, *Hall s.n.* (UC, US); Glenn Co.: S of Willows, 17 Jun 1934, *Howell 12247* (GH); Imperial Co.: between Brawley and Imperial, 17 Oct 1941, *MacBride and Drouet 4515* (F, UC); Inyo Co.: Independence, 4 Aug 1940, *Kerr s.n.* (TEX); Kern Co.: Bakersfield, 13 Nov 1926, *Bauer s.n.* (UC); Lassen Co.: Honey Lake Valley near Wendel, 12 Jul 1934, *Howell 12568* (F); Los Angeles Co.: Long Beach, 12 Nov 1928, *Bauer s.n.* (UC, US); Merced Co.: 1 mi NW of Los Banos, 27 Sep 1921, *Kennedy s.n.* (UC); Modoc Co.: Alturas, 10 Oct 1935, *Wheeler 4035* (GH, NY, US); Mono Co.: 4 mi SE of Fales Hot Springs, 9 Sep 1934, *Crum 1712* (UC); Orange Co.: West Newport Beach, 27 May 1932, *Booth 1130* (UC); San Benito Co.: Silver Creek, 4 Oct 1966, *Twisselmann 12877* (OSC); San Bernardino Co.: Searles Lake at Trona, 20 Oct 1964, *Twisselmann 10310* (OSC); San Diego Co.: San Diego, 18 Jul 1934, *Youngberg s.n.* (UC); San Francisco Co.: S of Hunter's Point, San Francisco, 3 Jun 1956; *Howell 31466* (OSC); San Mateo Co.: E of Redwood City, 27 Aug 1949, *Nobs and Smith 1617* (UC); Santa Clara Co.: Palo Alto Yacht Harbor, 12 Sep 1932, *Ferris 8267* (UC); Siskiyou Co.: Shasta Valley 4 mi E of Grenada, 21 Oct 1934, *Wheeler 3332* (F); Solano Co.: Suisun City, 9 Oct 1932, *Booth 2071* (F); Stanislaus Co.: W side of Modesto, 1 Oct 1928, *Dudley s.n.* (F); Tulare Co.: T23S, R24E, Sec 30, 2 mi SE of Stoil, 29 May 1940, *Bradshaw 333* (TEX); Ventura Co.: Ocean beach near mouth of Ventura River, 29 Sep 1945, *Pollard s.n.* (UC). COLORADO: Alamosa Co.: Alamosa, 2 Sep 1936, *Ramaley 15908* (RM); Bent Co.: Prowers, 3 Sep 1940, *Cory s.n.* (GH); Boulder Co.: just E of Boulder Reservoir, 19 Sep 1965, *Weber 12972* (TEX, NY, UT); Eagle Co.: Wolcott, 17 Sep 1960, *Perdue 4062* (US); Montezuma Co.: Cortez, 29 Aug 1947, *Durham s.n.* (F). IDAHO: Ada Co.: 4 mi N of Grandview, 19 Jun 1940, *Davis 2063* (F, NY, UC); Bingham Co.: Springfield, 4 Sep 1937, *Christ 8946* (NY); Cassia Co.: mouth of Raft River, 24 Aug 1940, *Christ 11803* (NY); Custer Co.: 1 mi NW of May, 20 Aug 1944, *Hitchcock and Muhlick 11304* (NY); Franklin Co.: ca. 15 mi NNW of Preston, 6 Sep 1961, *Bright 61-73* (RM); Gem Co.: 12 mi W of Emmett, 6 Aug 1937, *Christ 8526* (NY); Lemhi Co.: 4 mi S of Tendoy, 18 Aug 1956, *Baker 14642* (NY); Owyhee Co.: Homedale, 18 Aug 1928, *Haegete s.n.* (NY); Power Co.: 5 mi W of Pocatello, 12 Jul 1937, *Christ 8364* (NY); Twin Falls Co.: 2 mi E of Buhl, 14 Jul 1937, *Christ and Ward 8179* (NY); Washington Co.: 5 mi S of Weiser, 25 Jul 1940, *Davis 3003* (F). MASSACHUSETTS: Suffolk Co.: wasteland, South Boston, 5 Sep 1936, *Bean s.n.* (GH). MONTANA: Phillips Co.: National Wildlife Refuge, Bowdoin, 26 Sep 1940, *Hotchkiss s.n.* (US); Sanders Co.: Perma, 17 Sep 1927, *Kirkwood 2497* (GH, RM). NEVADA: Churchill Co.: Fallon, 18 Aug 1917, *Kearney s.n.* (US); Clark Co.: across from hospital, Boulder, 8 Jun 1967, *Mears 1942* (TEX); Elko Co.: 7 mi N of Currie, 10 Sep 1937, *Train 969* (F, MO, UC); Humboldt Co.: Ashdown Mine, Pine Forrest Range, 22 Sep 1934, *Train 189* (US); Lander Co.: 10 mi W of Austin, 30 Aug 1937, *Goodner and*

Henning 1294 (F, MO); Lyon Co.: T12N, R23E, Sec 36, Wellington, 20 Sep 1937, *Johannsen 1279* (UC); Mineral Co.: S end of Walker Lake, 6 Sep 1938, *Archer 6963* (UT); Nye Co.: Golden Eagle Mill NW of Ione, 20 Aug 1940, *Beach 1031* (UC); Storey Co.: 4 mi E of Virginia City, 10 Sep 1937, *Allen 524* (UC); Washoe Co.: Pyramid Lake, 7 Sep 1930, *Abrams 12917* (F, GH, UC); White Pine Co.: T15N, R68E, Sec 19, 13 Aug 1964, *Holmgren and Reveal 1642* (GH, NY). NEW MEXICO: Doña Ana Co.: Mesquite, Mesilla Valley, 7 Aug 1930, *Fosberg 53831* (UC); Sandoval Co.: Bernalillo, 11 Jul 1926, *Arsène and Benedict 16799* (F, US). NEW YORK: Bronx Co.: Pelham Bay Park, N.Y. City, 10 Oct 1954, *Monachino 551* (NY); Queens Co.: Newton Creek, Queens, Long Island, 3 Sep 1936, *Monachino 161* (US). OREGON: Gilliam Co.: Olex, 15 Oct 1938, *Cooke 12112* (OSC); Grant Co.: Canyon City, 31 May 1951, *Farrell s.n.* (OSC); Harney Co.: Malheur Lake, 30 mi S of Burns, 13 Aug 1957, *Hansen s.n.* (OSC); Lake Co.: 1932, *Hill s.n.* (OSC); Malheur Co.: Ontario, 7 Sep 1928, *Larsen s.n.* (GH, OSC); Morrow Co.: Irragon, 1 Aug 1933, *Peck 18100* (OSC); Sherman Co.: 29 Sep 1955, *Thompson s.n.* (OSC); Umatilla Co.: Hermiston, Nov 1932, *Best s.n.* (OSC); Union Co.: North Powder, 15 Aug 1958, *Sidor s.n.* (OSC); Wheeler Co.: 3 mi W of Mitchell, 20 Jul 1934, *Peck 18641* (OSC). SOUTH DAKOTA: Jones Co.: 1 mi S of Murdo, 28 Aug 1959, *Wiggins 14974* (US). TEXAS: El Paso Co.: N of El Paso, Sep 1938, *Kelly s.n.* (GH); Hudspeth Co.: Trans Pecos, 2 mi SE of McNary, 18 Aug 1942, *Waterfall 3971* (GH); Reeves Co.: Pecos, 4 Sep 1939, *Cory 32958* (GH); Ward Co.: Barstow, 20 Jul 1928, *Cory 1454* (GH). UTAH: Box Elder Co.: Sulphur Springs, 15 Aug 1929, *Garrett 5423* (UT); Carbon Co.: 10 mi E of Wellington, 7 Aug 1940, *van Cott 78* (NY); Davis Co.: Farmington Bay Waterfoul Management Area, 8 Jul 1966, *Arnell s.n.* (UT); Duchesne Co.: waste places, 2 Sep 1938, *Harrison and Garrett 8886* (UC); Salt Lake Co.: saline flats, 26 Sep 1924, *Garrett 3190* (US, UT); Sanpete Co.: Ephraim, 15 Sep 1934, *Olsen s.n.* (UC); Sevier Co.: SW corner of airfield S of Richfield, 16 Sep 1944, *Holmgren and Evans 3822* (GH, NY, UC); Tooele Co.: W of Garfield, 6 Aug 1929, *Garrett 5325* (UT); Uintah Co.: Thorne's Ranch, Willow Creek, 5 Aug 1935, *Graham 9983* (F); Utah Co.: Utah Lake, Provo, 6 Oct 1935, *Larson 6678* (US); Washington Co.: T43S, R16W, Sec 13, between fields and Virgin River at Bloomington, 9 Aug 1963, *Christian 1112* (UT); Wayne Co.: Henry Mountains, 15 Aug 1966, *Everitt 211* (UT); Weber Co.: Ogden Bay, 29 Jul 1955, *McHugh s.n.* (NY). WASHINGTON: Grant Co.: S end of Soap Lake, 15 Aug 1943, *Eyerdam 6389* (UC); Okanogan Co.: between Omak and Okanogan, 15 Sep 1933, *Fiker 1426* (US); Whitman Co.: Pullman, 23 Sep 1925, *Pickett s.n.* (GH, US); Yakima Co.: Yakima, 3 Oct 1921, *Nelson 1002* (US). WYOMING: Albany Co.: Laramie, 31 Aug 1939, *Meunscher and Meunscher 15931* (GH); Sweetwater Co.: Flaming Gorge Reservoir at Firehole, 20 Aug 1968, *Porter and Porter 10599* (RM); Washakie Co.: W of Worland, 31 Jul 1962, *Nichols 516* (RM).

REFERENCES

AELLEN, P. 1964. *In*: Tutin et al. Flora Europaea. Vol. 1. University Press, Cambridge.

AIRY SHAW, H. K. 1973. Willis' dictionary of the flowering plants and ferns (8th ed.). University Press, Cambridge.

BEAN, R. C. 1937. Two rare weeds. Rhodora 39: 208–209.

BLAKE, S. F. 1922. Two new western weeds. Science 55(1426): 455–456.

BRITTON, N. L. and A. BROWN. 1913. An illustrated flora of the northern United States, Canada, and the British possessions (2nd ed.). Vol. 2. Scribner's New York.

DAVIS, R. J. 1952. Flora of Idaho. Brigham Young University Press, Provo, Utah.

FERNALD, M. L. 1950. Gray's manual of botany (8th ed.). American Book Co., New York.

GLEASON, H. A. 1952. The New Britton and Brown illustrated flora of the northeastern United States and adjacent Canada. Vol. 2. New York Botanical Garden, New York.
HARRINGTON, H. D. 1954. Manual of the plants of Colorado. Sage Books, Denver.
HITCHCOCK, C. L. and A. CRONQUIST. 1973. Flora of the Pacific Northwest, an illustrated manual. University of Washington Press, Seattle and London.
ILJIN, M. 1936. *In*: V. L. Komarov and B. K. Shishkin. Flora USSR. Vol. 6. Akademia Nauk SSSR. Moscow, Leningrad.
JEPSON, W. L. 1923. A manual of the flowering plants of California. Associated Students Store, Berkeley.
KEARNEY, T. H. and R. H. PEEBLES. 1960. Arizona flora. University of California Press, Berkeley and Los Angeles.
MASON, H. L. 1957. A flora of the marshes of California. University of California Press, Berkeley and Los Angeles.
MOSS, E. H. 1959. Flora of Alberta. University of Toronto Press, Toronto.
MUNZ, P. A. and D. D. KECK. 1959. A California flora. University of California Press, Berkeley and Los Angeles.
PALMER, E. J. 1930. The spontaneous flora of the Arnold Arboretum. J. Arnold Arbor. 11: 63–119.
ROBINSON, B. L. and M. L. FERNALD. 1908. Gray's manual of botany (7th ed.). American Book Co., New York.
RYDBERG, P. A. 1906. Flora of Colorado. Bull. Colorado State Univ. Exp. Sta. 100.
———. 1917. Flora of the Rocky Mountains and adjacent plains. Published by the author, New York.
SEYMOUR, F. C. 1969. The flora of New England. Charles E. Tuttle Co., Rutland, Vermont.
STANDLEY, P. C. 1916. *In*: North American flora. Vol. 21(1). New York Botanical Garden, New York.
TAYLOR, N. 1915. Flora of the vicinity of New York. Mem. New York Bot. Gard. 5: 1–683.
TIDESTROM, I. 1925. Flora of Utah and Nevada. Contr. U. S. Nat. Herb. Vol. 25.
WEBER, W. 1972. Rocky Mountain flora. University of Colorado Press, Boulder.